

1    **CLAIMS:**

2    We claim:

- 3    1.   A data processing method comprising controlling a  
4        computer to address at least one predetermined element  
5        in a structured document, comprising the steps of:
- 6        when the structured document having said at least one  
7        predetermined element addressed by predetermined  
8        addressing information is modified, inputting the  
9        structured document to analyze the modification and  
10       storing an analysis result in a memory;
- 11       reading the analysis result from the memory; and
- 12       updating the addressing information according to the  
13       analyzed modification so that the addressing  
14       information addresses at least one corresponding  
15       element or corresponding elements in the modified  
16       structured document.
- 17    2.   A data processing method according to Claim 1, wherein  
18        the step of updating the addressing information  
19        comprises updating the addressing information written  
20        in XPath.
- 21    3.   A difference computation method comprising controlling a  
22        computer to compute a difference between at least two  
23        tree-structured data items, comprising the steps of
- 24        a first step of reading at least two tree-structured  
25        data items to be processed from memory to compare the

1       at least two tree-structured data items, creating an  
2       operation sequence, in which each operation for  
3       transforming one of the tree-structured data items  
4       into the other tree-structured data item is expressed  
5       as a combination of predetermined operations on a  
6       component of a tree-structure, and storing the list in  
7       memory; and

8       a second step of reading the operation sequences from  
9       the memory and changing operations in the operation  
10      sequence that are interpreted as a movement of a  
11      component into an operation of moving the component.

12    4.   A difference computation method according to Claim 3,  
13       wherein the first step comprises creating an operation  
14       sequence in which each operation for transforming the  
15       tree-structured data is expressed as a combination of  
16       operations of inserting, removing, or modifying a node  
17       or a subtree of a tree structure.

18    5.   An addressing information generation system comprising:

19       a difference computation unit for computing a  
20       difference between structured documents; and

21       an addressing information generation unit for  
22       generating addressing information from addressing  
23       information that addresses a part of a particular  
24       structured document based on information on the  
25       difference computed by the difference computation  
26       unit, the generated addressing information addressing  
27       a corresponding part of the other structured document.

- 1 6. An addressing information generation system according to  
2 Claim 5, further comprising a document analysis unit  
3 for analyzing structures of the structured documents  
4 and converting the structures into tree-structured  
5 data items,
- 6 wherein the difference computation unit computes the  
7 difference by comparing the tree-structured data items  
8 corresponding to the structured documents converted by  
9 the document analysis unit.
- 10 7. An addressing information generation system according to  
11 Claim 6, wherein the difference computation unit  
12 computes the difference between the tree-structured  
13 data items to track a component of the tree-structured  
14 data items that is moved in operations for  
15 transforming one of the tree-structured data items  
16 into the other tree-structured data item.
- 17 8. An addressing information generation system according  
18 to Claim 5, wherein the addressing information is  
19 written in XPath.
- 20 9. An addressing information generation system according  
21 to Claim 8, wherein the addressing information  
22 generation unit generates an XPath for the other  
23 structured document by regenerating LocationSteps  
24 forming an XPath for the particular structured  
25 document based on the difference between the  
26 structured documents and on the XPath for the  
27 particular structured document.
- 28 10. A program for controlling a computer so that the

1 computer performs data processing for addressing at  
2 least one predetermined element in a structured  
3 document, the program causing the computer to perform:

4 first processing of, when the structured document  
5 having the element addressed by predetermined  
6 addressing information is modified, inputting the  
7 structured document to analyze the modification and  
8 storing an analysis result in a memory; and

9 second processing of reading the analysis result from  
10 the memory and updating the addressing information  
11 according to the analyzed modification so that the  
12 addressing information addresses at least one  
13 corresponding element in the modified structured  
14 document.

15 11. A program according to Claim 10,

16 wherein the first processing provided by the program  
17 comprises the processing of:

18 converting an unmodified version and a modified  
19 version of the structured document into  
20 tree-structured data items; and

21 computing a difference between the tree-structured  
22 data items, and

23 wherein in the second processing provided by the  
24 program, the program causes the computer to update the  
25 addressing information based on the difference between  
26 the tree-structured data items.

- 1 12. A program according to Claim 11, wherein in the  
2 processing of computing the difference provided by the  
3 program, the program causes the computer to compute  
4 the difference between the tree-structured data items  
5 to track a component of the tree-structured data items  
6 that is moved in operations required for  
7 transformation between the tree-structured data items  
8 transformed from one to the other according to  
9 modification of the structured document.
- 10 13. A program according to Claim 10, wherein in the second  
11 processing provided by the program, the program causes  
12 the computer to update an XPath describing the  
13 addressing information by regenerating LocationSteps  
14 forming the XPath based on the difference between the  
15 unmodified version and the modified version of the  
16 structured document.
- 17 14. A program for controlling a computer to compute a  
18 difference between at least two tree-structured data  
19 items, the program causing the computer to perform:
- 20 first processing of reading at least two  
21 tree-structured data items to be processed from memory  
22 to compare the at least two tree-structured data  
23 items, creating an operation sequence, in which each  
24 operation for transforming one of the tree-structured  
25 data items into the other tree-structured data item is  
26 expressed as a combination of predetermined operations  
27 on a component of a tree-structure, and storing the  
28 list in memory; and

1 second processing of reading the operation sequences  
2 from the memory and changing operations in the  
3 operation sequence that are interpreted as a movement  
4 of a component into an operation of moving the  
5 component.

6 15. A program according to Claim 14, wherein in the second  
7 processing provided by the program, the program causes  
8 the computer to add an operation of moving a component  
9 of the tree-structured data items to the operation  
10 sequences in place of a pair of operations of removing  
11 and inserting the component in the operation  
12 sequences.

13 16. A program according to Claim 14, wherein in the second  
14 processing provided by the program, the program causes  
15 the computer to replace, based on a predetermined  
16 rule, an operation of modifying a component of the  
17 tree-structured data items in the operation sequences  
18 with a different operation that involves moving the  
19 component.

20 17. An annotation server for managing annotation data made  
21 for an HTML/XML document, the annotation server  
22 comprising:

23 difference computation means for computing, when the  
24 HTML/XML document for which the annotation data has  
25 been made is modified, a difference between an  
26 unmodified version and a modified version of the  
27 HTML/XML document; and

28 XPath update means for updating, based on difference

1           information obtained from computation by the  
2           difference computation means, an XPath associating the  
3           annotation data with a part of the HTML/XML document.

4   18.    An article of manufacture comprising a computer usable  
5   medium having computer readable program code means embodied  
6   therein for causing data processing, the computer readable  
7   program code means in said article of manufacture comprising  
8   computer readable program code means for causing a computer  
9   to effect the steps of claim 1.

10   19.   A program storage device readable by machine, tangibly  
11   embodying a program of instructions executable by the  
12   machine to perform method steps for data processing, said  
13   method steps comprising the steps of claim 1.

14   20.   An article of manufacture comprising a computer usable  
15   medium having computer readable program code means embodied  
16   therein for causing difference computation, the computer  
17   readable program code means in said article of manufacture  
18   comprising computer readable program code means for causing  
19   a computer to effect the steps of claim 3.

20   21.   A program storage device readable by machine, tangibly  
21   embodying a program of instructions executable by the  
22   machine to perform method steps for difference computation,  
23   said method steps comprising the steps of claim 3.

24   22.   A computer program product comprising a computer  
25   usable medium having computer readable program code means  
26   embodied therein for causing addressing information  
27   generation, the computer readable program code means in said  
28   computer program product comprising computer readable

1 program code means for causing a computer to effect the  
2 functions of claim 5.

3 22. A computer program product comprising a computer  
4 usable medium having computer readable program code means  
5 embodied therein for causing management of annotation data  
6 made for an HTML/XML document, the computer readable program  
7 code means in said computer program product comprising  
8 computer readable program code means for causing a computer  
9 to effect the functions of claim 17.